

NSTX-U Weekly Report (June 15, 2012)

NSTX-U is in the Upgrade Project outage in FY 2012

The article "The effect of progressively increasing lithium coatings on plasma discharge characteristics, transport, edge profiles, and ELM stability in the National Spherical Torus Experiment" by R. Maingi (ORNL), et. al., was published in Nucl. Fusion 52 ([2012](#)) [083001](#). The article documents the results of lithium coating scans, showing that increasing lithium coatings result in progressively increasing effects on confinement, profiles, and stability. The article represents the work presented at the 2010 IAEA conference and expands on the recent Phys. Rev. Letter published in 2011. (R. Maingi)

Jon Menard, Mike Jaworski, Dennis Mueller, and Egemen Kolemen from PPPL travelled to EAST this week to lead an experiment to assess the relative particle pumping capabilities of lithium and cryo-pumping, and also to participate in other collaboration meetings and discussions. Kevin Tritz from JHU also joined in the trip and the experiment. A supersonic molecular beam injector (SMBI) was used for precise density feedback control and to modulate the gas fueling to measure particle pump-out times in L-mode plasmas heated with lower hybrid waves. Divertor Langmuir probe data was also taken to measure ion saturation current response to the gas fueling, and the saturation current decay-rate trends (related to local divertor recycling rates) are consistent with the global pumping trends as indicated by the total SMBI fueling required to maintain constant line-average electron density. The global density and local/divertor pump-out measurements were obtained for a variety of configurations including upper single null, double null, and lower single null, and up-down asymmetries in global pumping rates were evident. Degradation of very strong pumping by lithium was observed after 6-8 shots (60-80 total shot-seconds), and the lithium pumping reached 2-3 times lower but stationary values after 20-25 shots (200-250 total shot-seconds). Strike-point variations were also performed both with and without cryo-pumping for LSN discharges, and the results indicate the density pump-out is a very sensitive function of the strike-point position in the divertor. It was observed that variations as small as a few cm changed the global pumping rate by up to a factor of two. The analysis and interpretation of this dataset is ongoing. J. Menard, M. Jaworski, and others also participated in meetings discussing possible future experiments and collaborations with EAST. (J. Menard)

Engineering Operations (A. von Halle, C. Neumever)

NSTX Upgrade construction activities continued this week the TIG and then MIG welding of the first TF clevis pad at bay C upper. The MIG welding is being performed with a new low magnetic permeability welding wire tested previously in our shops, and distortion measurements are being made after each pass. The remainder of the TF clevis bushings and a new vessel piece for the MPTS diagnostic are ready for pick-up from the heat treating vendor. Set-up for the planned cutting of the bay J and K nozzles continues, with that operation now scheduled for next week. Soldering of cooling tubes into the new TF inner conductors continues and has become a fairly routine operation. On neutral beams, refurbishment and fabrication of parts for the second beam-line continues, and inspections/leak checking of the two new 1 meter VAT valves needed to isolate each beam-line from the NSTX torus has started.

Access to the NSTX test cell will be available only through previous arrangement with the Upgrade Work Control Center.